Arc Flash Exercise 5

Purpose & Description

The purpose of this exercise is to determine the Arc Flash Incident Energy for a fault at low voltage bus. The incident energy will be estimated using both the NFPA 70E 2004 and the IEEE 1584 2002 (2004a) methods. The final results for each method are to be tabulated and the differences between the results are to be determined.

The system being analyzed can be considered to be Enclosed (Cubic Box). Typical working distance for a 0.480 kV system can be 18.0 in.

Setup

Load the project file named “Arc Flash Example5”. The solution to this example is located in a directory called “Solution5”. Open the solution project only to compare against your exercise once completed.

Procedure

Step1

Switch to Protective Device Coordination Mode. Using the Sequence of Operation tool, place faults at bus “**SWGR B**”.

1.1 In revision “**Base**”, Fault bus “**SWGR B**”. Use output report “**SWGRB_MaxSC**”. Record the operating time of CB5 (Fault Clearing Time) and the fault current in Table1 (see Figure 1).

1.2 Switch to revision “**MinRev**”. Fault bus “**SWGR B**”. Use output report “**SWGRB_MinSC**”. Record the operating time of CB5 (Fault Clearing Time) and the fault current in Table1.

Step2

Switch to Short-circuit Analysis Mode. Using study case NFPA 70E run the arc flash calculation for the following situations:

2.1 In revision “**Base**”, Fault bus “**SWGR B**”. Use output report “**NFPA70E_Max**”. Determine the incident energy released at for a fault at the Bus at the time recorded from step 1.1. Record in the results in Table1.

2.2 Switch to revision “**MinRev**”. Fault bus “**SWGR B**”. Use output report “**NFPA70E_Min**”. Determine the incident energy released at for a fault at the Bus at the time recorded from step 1.2. Record the results in Table1.

2.3 Switch back to **base** revision. Select study case **IEEE 1584**. Use output report “**IEEE1584**”. Run AF Calculation. Determine the Fault Clearing Time and the Incident Energy for a fault at the bus. Record the results in Table1.

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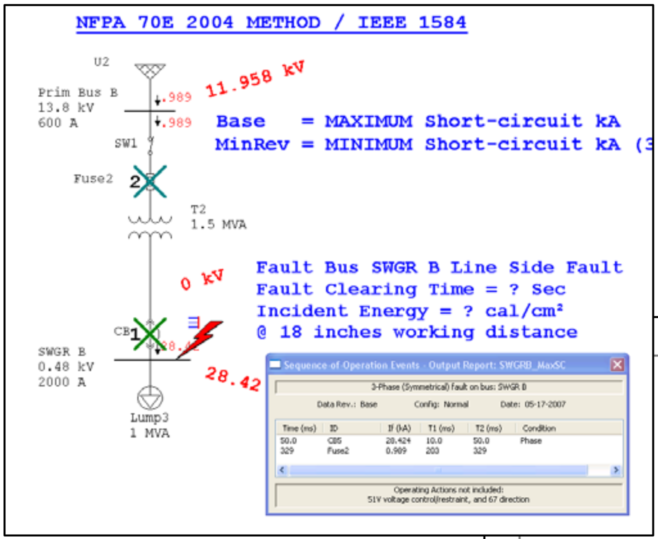
Table1: Tabulated results for Low Voltage Arc Flash Result for NFPA70E and IEEE1584

Step	SWGR B Ibf / Ia (kA)	Fault Clearing Time (FCT) sec.	Incident Energy (cal/cm²)
NFPA Max SC (1.1)(2.1)			
NFPA Min SC (1.2)(2.2)			
IEEE 1584 (2.3)			


NFPA 70E 2004 METHOD / IEEE 1584
U2
Prim Bus B
13.8 kV
600 A
.989
.989
11.958 kV
SW1
Fuse2
2
T2
1.5 MVA
0 kV
CB1
SWGR B
0.48 kV
2000 A
28.42
Lump3
1 MVA

Base = MAXIMUM Short-circuit kA
MinRev = MINIMUM Short-circuit kA (3

Fault Bus SWGR B Line Side Fault
Fault Clearing Time = ? Sec
Incident Energy = ? cal/cm²
@ 18 inches working distance

Sequence of Operation Events - Output Report: SWGRB_MaxSC

3-Phase (Symmetrical) fault on bus: SWGR B

Data Rev.: Base Config: Normal Date: 05-17-2007

Time (ms)	ID	If (kA)	T1 (ms)	T2 (ms)	Condition
50.0	CB5	28.424	10.0	50.0	Phase
329	Fuse2	0.989	203	329	

Operating Actions not included:
51V voltage control/restraint, and 67 direction

Figure1: Sequence of Operation faults

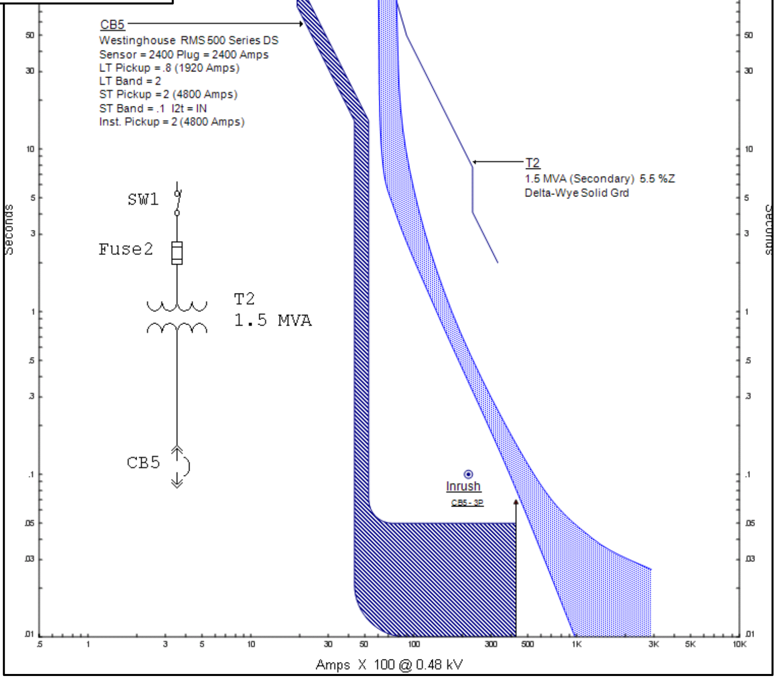


Figure 2: Transformer Protection TCCs

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